

comprises the steps of: fabricating a semiconductor image sensing element; providing connection between electrode portions of the semiconductor image sensing element and electrode terminals of a mounting substrate having an opening wider than at least an image sensing area of the semiconductor image sensing element and having the electrode terminals arranged around the opening to be connected to the electrode portions of the semiconductor image sensing element by a face-down mounting method by using bumps provided on respective surfaces of the electrode portions; and forming a molding resin on a mounting region between the semiconductor image sensing element and the mounting substrate and on a portion of the mounting substrate which is adjacent to the mounting region, wherein the step of fabricating the semiconductor image sensing element is made of the method described above.

[0040] The method prevents flare, smear, or the like and allows a semiconductor image sensing device having excellent properties to be fabricated in simple and easy steps. It is also possible to fabricate a thinner and more compact semiconductor image sensing device by mounting the semiconductor image sensing element by a face-down mounting method.

[0041] A third method for fabricating a semiconductor image sensing device according to the present invention comprises the steps of: fabricating a semiconductor image sensing element; providing connection between electrode portions of the semiconductor image sensing element and a mounting substrate having an opening wider than at least an image sensing area of the semiconductor image sensing element and having electrode terminals arranged around the opening to be connected to the electrode portions of the semiconductor image sensing element by a face-down mounting method by using bumps provided on respective surfaces of the electrode portions of the semiconductor image sensing element; and forming a molding resin on a mounting region between the semiconductor image sensing element and the mounting substrate and on a portion of the mounting substrate which is adjacent to the mounting region, wherein the semiconductor image sensing element comprises a semiconductor element including the image sensing area, a peripheral circuit region, the plurality of electrode portions provided in the peripheral circuit region, and a plurality of micro-lenses provided on the image sensing area and an optical member having a configuration covering at least the image sensing area and bonded over the micro-lenses via a transparent bonding member and the molding resin covers the electrode portions, the bumps, and the electrode terminals and is made by using a material which cuts off at least a visible light beam and cures with an application of a UV light beam or heat.

[0042] The method can prevent the occurrence of flare, smear, or the like through a simple and easy process step of merely injecting a molding resin having a property of cutting off a visible light beam and allows low-cost fabrication of a semiconductor image sensing device having excellent properties. Since the semiconductor image sensing element is mounted on the mounting substrate by a face-down mounting method using bumps, a thinner and more compact semiconductor image sensing device can be implemented. The semiconductor image sensing element can be securely fixed to the mounting substrate by injecting the molding resin and curing the surface layer thereof, while irradiating

the molding resin with a UV light beam through the opening of the mounting substrate, and then thermally or naturally curing the molding resin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] FIG. 1 is a cross-sectional view showing a structure of a semiconductor image sensing element according to a first embodiment of the present invention;

[0044] FIG. 2A is a plan view showing semiconductor elements according to the first embodiment that have been formed on a semiconductor wafer, FIG. 2B is a plan view of each of the separate individual semiconductor elements, and FIG. 2C is a cross-sectional view along the line A-A of FIG. 2B;

[0045] FIGS. 3A to 3D are cross-sectional views for illustrating the main process steps after optical members are bonded to the individual semiconductor elements on the semiconductor wafer till the semiconductor wafer is processed into the separate individual semiconductor image sensing elements in a method for fabricating the semiconductor image sensing element according to the first embodiment;

[0046] FIG. 4A is a cross-sectional view of a first variation of the optical member used for the semiconductor image sensing element according to the first embodiment, FIG. 4B is a cross-sectional view of a second variation of the optical member, FIG. 4C is a cross-sectional view of a third variation of the optical member, and FIG. 4D is a cross-sectional view of a fourth variation of the optical member;

[0047] FIG. 5 is a cross-sectional view showing a structure of a semiconductor image sensing device constructed by using the semiconductor image sensing element according to the first embodiment;

[0048] FIGS. 6A to 6D are cross-sectional views illustrating the main process steps for fabricating the semiconductor image sensing device according to the first embodiment;

[0049] FIG. 7 is a cross-sectional view showing a structure of a semiconductor image sensing element according to a second embodiment of the present invention;

[0050] FIG. 8A to 8C are cross-sectional views illustrating the main process steps of a method for fabricating the semiconductor image sensing element according to the second embodiment;

[0051] FIG. 9 is a cross-sectional view showing a structure of a semiconductor image sensing device constructed by using the semiconductor image sensing element according to the second embodiment;

[0052] FIG. 10 is a cross-sectional view showing a structure of a semiconductor image sensing element according to a third embodiment of the present invention;

[0053] FIG. 11 is a cross-sectional view showing a structure of a semiconductor image sensing device using the semiconductor image sensing element according to the third embodiment;

[0054] FIGS. 12A to 12C are cross-sectional views illustrating the main process steps for fabricating the semiconductor image sensing device according to the third embodiment;